

WHAT IS CLAIMED IS:

- 1 1. An electrosurgical probe, comprising:
2 a shaft having a shaft distal end portion and a shaft proximal end
3 portion;
4 an electrode support disposed on the shaft distal end portion;
5 an active electrode disposed on the electrode support; and
6 a return electrode disposed on the shaft distal end portion, wherein
7 the shaft distal end portion is adapted for being shifted between a first configuration
8 or a second configuration, wherein the first configuration is adapted for clamping
9 and coagulating a tissue, and the second configuration is adapted for releasing and
10 severing the tissue.
- 11
1 2. The probe of claim 1, wherein at least one of the active
2 electrode and the return electrode is moveable.
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1 3. The probe of claim 1, wherein the active electrode is fixed
2 and the return electrode is pivotable.
- 3
1 4. The probe of claim 3, wherein the return electrode is
2 pivotable about the return electrode proximal end.
- 3
1 5. The probe of claim 1, wherein the return electrode and the
2 active electrode are in opposition.
- 3
1 6. The probe of claim 1, wherein the first configuration is a
2 closed configuration wherein the return electrode and the active electrode are
3 juxtaposed, and the second configuration is an open configuration wherein the return
4 electrode and the active electrode are parted from each other.
- 5
1 7. The probe of claim 6, wherein in the closed configuration a
2 gap exists between the active electrode and the return electrode.
- 3

1 8. The probe of claim 7, wherein in the closed configuration the
2 gap between the active electrode and the return electrode in the range of from about
3 0.2 mm to about 10 mm.

1 9. The probe of claim 6, wherein in the closed configuration the
2 return electrode is arranged substantially parallel to the active electrode.

1 10. The probe of claim 6, wherein in the closed configuration the
2 return electrode is disposed superjacent to the active electrode.

1 11. The probe of claim 6, wherein in the closed configuration a
2 first portion of the active electrode is concealed by the return electrode.

1 12. The probe of claim 11, wherein in the open configuration the
2 first portion of the active electrode is at least partially exposed.

1 13. The probe of claim 1, wherein in the open configuration the
2 return electrode is arranged at an angle in the range of from about 30° to 120° to
3 the active electrode.

1 14. The probe of claim 1, wherein the return electrode comprises
2 a cowl.

1 15. The probe of claim 14, wherein the cowl is curved in a lateral
2 direction.

1 16. The probe of claim 14, wherein the cowl distal end is quasi
2 dome-shaped.

1 17. The probe of claim 14, wherein the cowl includes a notch in
2 the cowl distal end, the notch adapted for accommodating a portion of the active
3 electrode when the shaft distal end portion is in the closed configuration.

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1 18. The probe of claim 1, wherein the return electrode comprises
2 a removeable cowl.

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1 19. The probe of claim 1, wherein the return electrode has an
2 undulating perimeter.

3
1 20. The probe of claim 1, wherein the active electrode is disposed
2 on the distal terminus of the electrode support.

3
1 21. The probe of claim 1, wherein the active electrode protrudes
2 distally and laterally from the electrode support.

3
1 22. The probe of claim 1, wherein the active electrode protrudes
2 from the electrode support by a distance in the range of from about 0.2 mm to about
3 10 mm.

4
1 23. The probe of claim 1, wherein the active electrode consists
2 essentially of a single blade having at least one active edge and first and second
3 blade sides.

4
1 24. The probe of claim 1, wherein at least a portion of the active
2 electrode is serrated.

3
1 25. The probe of claim 1, wherein the active electrode is adapted
2 for severing a target tissue via localized molecular dissociation of target tissue
3 components.

4
1 26. The probe of claim 1, wherein the active electrode comprises
2 a material selected from the group consisting of platinum, tungsten, palladium,
3 iridium, and titanium.

1 27. The probe of claim 1, wherein the shaft comprises an
2 insulating material, and the electrode support comprises a ceramic or a silicone
3 rubber.
4

1 28. The probe of claim 6, further comprising an actuator unit for
2 shifting the probe between the open configuration and the closed configuration.
3

1 29. The probe of claim 28, wherein the actuator unit comprises a
2 clamp unit for urging the shaft distal end portion towards the closed configuration.
3

1 30. The probe of claim 29, wherein the clamp unit is adapted for
2 exerting a force on at least one of the return electrode and the active electrode.
3

1 31. The probe of claim 28, wherein the actuator unit comprises a
2 release unit for urging the shaft distal end portion towards the open configuration.
3

1 32. The probe of claim 28, further comprising a handle affixed to
2 the shaft proximal end portion, wherein the actuator unit is disposed on the handle.
3

1 33. The probe of claim 32, wherein the handle accommodates a
2 connection block, the connection block adapted for coupling the active electrode and
3 the return electrode to a high frequency power supply.
4

1 34. The probe of claim 1, further comprising a mode switch for
2 switching the probe between a sub-ablation mode and an ablation mode.
3

1 35. The probe of claim 34, wherein the mode switch is responsive
2 to a configuration of the shaft distal end portion.
3

1 36. The probe of claim 35, wherein the mode switch switches the
2 system to the sub-ablation mode when the shaft distal end portion is in the closed
3 configuration.

4
1 37. The probe of claim 35, wherein the mode switch switches the
2 system to the ablation mode when the shaft distal end portion is in the open
3 configuration.

4
1 38. The probe of claim 34, wherein the mode switch is responsive
2 to actuation of an actuator unit, the actuator unit adapted for shifting the probe
3 between an open configuration and a closed configuration.

4
1 39. The probe of claim 38, wherein the mode switch switches the
2 probe to the sub-ablation mode when the probe is shifted to the closed configuration.

3
1 40. The probe of claim 38, wherein the mode switch switches the
2 system to the ablation mode when the probe is shifted to the open configuration.

3
1 41. An electrosurgical system, comprising:
2 a shaft having a shaft distal end portion and a shaft proximal end
3 portion, the shaft distal end portion capable of adopting an open configuration or a
4 closed configuration;
5 an electrode support disposed on the shaft distal end portion;
6 an active electrode disposed on the electrode support;
7 a return electrode disposed on the shaft distal end portion;
8 a power supply having first and second opposite poles, the active and
9 the return electrode coupled to the first and second opposite poles, the power supply
10 adapted for applying a high frequency voltage between the active electrode and the
11 return electrode; and

12 an actuator unit in communication with at least one of the active
13 electrode and the return electrode, the actuator unit adapted for shifting the shaft
14 distal end portion between the open configuration and the closed configuration.

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1 42. The system of claim 41, wherein the return electrode is
2 moveable with respect to the active electrode, and actuation of the actuator unit

3 moves the return electrode such that the shaft distal end portion adopts the open
4 configuration or the closed configuration.

1 43. The system of claim 41, further comprising a mode switch for
2 switching the system between a sub-ablation mode and an ablation mode.

1 44. The system of claim 43, wherein the mode switch is
2 responsive to a shift in configuration of the shaft distal end portion.

1 45. The system of claim 43, wherein the mode switch is
2 responsive to actuation of the actuator unit.

1 46. The system of claim 45, wherein the actuator unit comprises a
2 release unit, and the mode switch switches the system to the ablation mode when the
3 release unit is actuated.

1 47. The system of claim 41, wherein the closed configuration is
2 adapted for clamping and coagulating a target tissue, and the open configuration is
3 adapted for releasing and ablating the target tissue.

1 48. The system of claim 41, wherein in the sub-ablation mode the
2 active electrode is adapted for coagulating a target tissue.

1 49. The system of claim 43, wherein in the ablation mode the
2 active electrode is adapted for ablating a target tissue via localized molecular
3 dissociation of target tissue components.

1 50. An electrosurgical probe, comprising:
2 a shaft having a shaft distal end portion and a shaft proximal end
3 portion;
4 an electrode support affixed to the shaft distal end portion;
5 an active electrode arranged on the electrode support; and

6 a moveable return electrode opposing the active electrode, the return
7 electrode adapted for movement between a closed configuration and an open
8 configuration, wherein in the closed configuration the return electrode is juxtaposed
9 with the active electrode, and in the open configuration the return electrode is
10 withdrawn from the active electrode.

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1 51. The probe of claim 50, wherein the return electrode comprises
2 a removeable cowl.

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1 52. The probe of claim 50, further comprising an actuator unit for
2 moving the return electrode between the closed configuration and the open
3 configuration.

4
1 53. The probe of claim 52, further comprising a mode switch in
2 communication with the actuator unit, the mode switch for switching the probe
3 between a sub-ablation mode and an ablation mode.

4
1 54. The probe of claim 53, wherein the mode switch is responsive
2 to a configuration of the return electrode or to actuation of the actuator unit.

3
1 55. The probe of claim 50, wherein in the closed configuration the
2 active electrode is arranged substantially parallel to the return electrode, and a first
3 portion of the active electrode is at least partially concealed by the return electrode
4

1 56. The probe of claim 55, wherein in the open configuration the
2 active electrode is exposed.

3
1 57. An electrosurgical probe, comprising:
2 a shaft having a shaft distal end portion and a shaft proximal end
3 portion;
4 a return electrode affixed to shaft distal end portion;
5 an electrode support affixed to the shaft distal end portion; and

6 a moveable active electrode mounted on the electrode support, the
7 active electrode capable of movement between a closed configuration and an open
8 configuration, wherein in the closed configuration the active electrode is juxtaposed
9 with the return electrode, and in the open configuration the active electrode is
10 withdrawn from the return electrode.

11
1 58. The probe of claim 57, wherein the active electrode comprises
2 a substantially flat elongate blade which protrudes axially and laterally from the
3 shaft, and the return electrode comprises a cowl.

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2 59. A method of modifying a target tissue of a patient,
3 comprising:

4 a) providing an electrosurgical probe having a shaft distal end, the
5 shaft distal end bearing an electrode support and a return electrode, the electrode
6 support having an active electrode affixed thereto, at least one of the active
7 electrode and the return electrode moveable responsive to actuation of an actuator
8 unit such that the shaft distal end can adopt an open configuration or a closed
9 configuration, the open configuration for accommodating at least a portion of the
10 target tissue between the active electrode and the return electrode, and the closed
11 configuration for clamping the target tissue between the active electrode and the
12 return electrode;

13 b) positioning the shaft distal end in at least close proximity to the
14 target tissue; and

15 c) applying a first high frequency voltage between the active electrode
16 and the return electrode, wherein at least a portion of the target tissue is ablated or
17 modified.

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1 60. The method of claim 59, wherein the ablated or modified
2 tissue is dissected, transected, incised, contracted, or coagulated.

3

1 61. The method of claim 59, wherein the first high frequency
2 voltage is in the range of from about 10 volts RMS to about 150 volts RMS.
3

1 62. The method of claim 59, further comprising:
2 d) after said step b) and before said step c), clamping the target tissue
3 between the active electrode and the return electrode.
4

1 63. The method of claim 59, wherein the first high frequency
2 voltage is sufficient to coagulate the target tissue and insufficient to ablate the target
3 tissue, and the method further comprises:

4 e) after said step c), applying a second high frequency voltage
5 between the active electrode and the return electrode, wherein at least a portion of
6 the target tissue is ablated.
7

1 64. The method of claim 63, wherein the second high frequency
2 voltage is in the range of from about 200 volts RMS to about 1000 volts RMS.
3

1 65. The method of claim 63, wherein neither said step c) nor said
2 step e) results in significant damage to non-target tissue.
3

1 66. The method of claim 59, wherein the return electrode
2 comprises a removeable cowl.
3

1 67. The method of claim 64, wherein during said step e) the target
2 tissue is ablated via electrosurgical molecular dissociation of tissue components in
3 the vicinity of the active electrode.
4

1 68. The method of claim 63, further comprising:
2 f) during said step e), manipulating the probe such that the active
3 electrode moves with respect to the target tissue.
4

1 69. A method of modifying a target tissue of a patient, the method
2 comprising:

3 a) providing an electrosurgical system including a probe and a power
4 supply, the probe adapted for clamping the target tissue, and the probe including a
5 shaft distal end bearing an electrode support and a return electrode, the electrode
6 support having an active electrode affixed thereto, the active electrode adapted for
7 coagulating the target tissue and for severing the target tissue via molecular
8 dissociation of target tissue components;

9 b) clamping the target tissue at the shaft distal end;

10 c) coagulating the target tissue by application of a first high frequency
11 voltage from the power supply to the active electrode; and

12 d) severing the target tissue by application of a second high frequency
13 voltage from the power supply to the active electrode.
14

1 70. The method of claim 69, further comprising:

2 e) prior to said step d) unclamping the target tissue.
3

1 71. The method of claim 69, wherein at least one of the active
2 electrode and the return electrode is adapted for moving such that the probe can
3 adopt an open configuration or a closed configuration.
4

1 72. The method of claim 69, wherein the electrosurgical system
2 further includes an actuator unit for shifting the probe between an open
3 configuration and a closed configuration.
4

1 73. The method of claim 72, wherein the probe includes a handle
2 and the actuator unit is arranged on the handle.
3

1 74. The method of claim 72, wherein said step b) comprises:

2 f) configuring the probe to the open configuration;

3 g) positioning the probe such that the target tissue is positioned
4 between the active electrode and the return electrode; and

5 h) configuring the probe to the closed configuration, wherein the
6 target tissue is clamped between the active electrode and the return electrode.

7
1 75. The method of claim 74, wherein at least one of said steps f)
2 and h) comprises actuating the actuator unit.

3
1 76. The method of claim 72, wherein the return electrode is
2 moveable via actuation of the actuator unit, and the return electrode is coupled to a
3 mode switch for switching the power supply between a sub-ablation mode and an
4 ablation mode.

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1 77. The method of claim 72, wherein the actuator unit is directly
2 coupled to a mode switch for switching the power supply between a sub-ablation
3 mode and an ablation mode.

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1 78. The method of claim 69, wherein the active electrode
2 comprises a single blade electrode, the single blade electrode including at least one
3 active edge and first and second blade sides.

4
1 79. A method of incising a target tissue with an electrosurgical
2 system including a probe and a power supply, the target tissue having at least one
3 blood vessel running therethrough, and the method comprising:

4 a) ablating the target tissue with the probe, the probe including an
5 active electrode and a return electrode coupled to the power supply, and the system
6 operating in an ablation mode;

7 b) upon encountering a blood vessel, clamping the blood vessel
8 between the active electrode and the return electrode;

9 c) switching the system to a sub-ablation mode adapted for
10 coagulating the blood vessel;

11 d) coagulating the clamped blood vessel; and

12 e) switching the system to the ablation mode, wherein the coagulated
13 blood vessel is severed.

14

1 80. The method of claim 79, further comprising:
2 f) prior to said step e), configuring the probe to an open configuration
3 wherein the coagulated blood vessel is unclamped.

4

1 81. The method of claim 79, wherein
2 said step c) comprises applying a first high frequency voltage between
3 the active electrode and the return electrode, the first high frequency voltage
4 sufficient to coagulate the blood vessel.

5

1 82. The method of claim 79, wherein
2 said step e) comprises applying a second high frequency voltage
3 between the active electrode and the return electrode, the second high frequency
4 voltage sufficient to ablate the coagulated blood vessel.

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1 83. The method of claim 82, wherein the second high frequency
2 voltage applied between the active electrode and the return electrode results in
3 localized molecular dissociation of tissue components of the coagulated blood
4 vessel.

5

1 84. The method of claim 79, wherein said step b) comprises:
2 g) configuring the probe to an open configuration;
3 h) positioning the probe distal end against the blood vessel; and
4 i) configuring the probe to a closed configuration, wherein the blood
5 vessel is clamped between the active electrode and the return electrode.

6

1 85. The method of claim 79, further comprising:
2 j) after said step e), manipulating the probe with respect to the
3 coagulated blood vessel.

4

1 86. A method of severing a blood vessel with an electrosurgical
2 system including a probe and a power supply, the method comprising:

- 3 a) positioning the blood vessel between an active electrode and a
4 return electrode;
5 b) clamping the blood vessel between the active electrode and the
6 return electrode;
7 c) applying a first high frequency voltage between the active electrode
8 and the return electrode, wherein the blood vessel is coagulated;
9 d) unclamping the coagulated blood vessel; and
10 e) applying a second high frequency voltage between the active
11 electrode and the return electrode, wherein the coagulated blood vessel is severed.
12

1 87. The method of claim 86, wherein at least one of the active
2 electrode and the return electrode is moveable.
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1 88. The method of claim 86, wherein the return electrode
2 comprises a removeable cowl.
3

1 89. The method of claim 86, wherein the electrosurgical system
2 further includes an actuator unit for shifting the probe between an open
3 configuration and a closed configuration, and a mode switch responsive to actuation
4 of the actuator unit, the mode switch coupled to the power supply, and the mode
5 switch adapted for switching the electrosurgical system between a sub-ablation mode
6 and an ablation mode upon actuation of the actuator unit.
7

1 90. The method of claim 86, wherein the return electrode is
2 moveable, the electrosurgical system further including a mode switch in
3 communication with the return electrode, the mode switch coupled to the power
4 supply, the mode switch adapted for switching the electrosurgical system between a
5 sub-ablation mode and an ablation mode, and the mode switch responsive to a
6 position of the return electrode.